

1 CLAIMS:

2 What is claimed, is:

3 1. An XML data encoding method comprising the steps of:
4 converting into ASN.1 abstract syntax type a grammar
5 definition for defining the grammar of XML data;
6 separating said XML data into the contents text of a
7 syntactic element and a structure an element name
8 including the structure;
9 converting said structure into an ASN.1 abstract
10 syntax value that conforms to said ASN.1 abstract syntax
11 type;
12 converting said ASN.1 abstract syntax value into an
13 ASN.1 transfer syntax;
14 compressing said contents of said syntactic element;
15 and
16 combining the compressed contents of said syntactic
17 element and said ASN.1 transfer syntax.

18 2. An XML data encoding method according to claim 1,
19 wherein said grammar definition includes an attribute, a
20 process instruction and a grammar definition entry other
21 than said syntactic element,
22 further comprising the steps of:
23 converting said grammar definition into a different
24 grammar definition, so that said grammar definition entry
25 other than said syntactic element is included in said
26 syntactic element as a special element; and

1 converting said XML data into different XML data in
2 conformation with said different grammar definition.

3 3. An XML data encoding method according to claim 1,
4 wherein said grammar definition is a DTD, the element
5 contents include operators selected from among: ",", "|",
6 "?", "*" and "+", no operator, any combination of these
7 operators; and; and wherein for said ASN.1 abstract syntax
8 type, said "," operator is represented by a "sequence"
9 type, said "|" operator is represented by a "choice" type,
10 said "?" operator is represented by a combination of a
11 "sequence" type and a keyword "OPTIONAL", said "*"
12 operator is represented by a "sequence-of" type, said "+"
13 operator is represented by a "sequence-of" type having a
14 limited size, and a case wherein none of said operators is
15 present is represented by a "defined" type.

16 4. An XML data encoding method according to claim 3,
17 wherein at said step of converting said grammar definition
18 into said different grammar definition, an attribute
19 included in said grammar definition is represented as an
20 attribute element that can be uniquely determined, and is
21 handled as the child element of a parent element of said
22 attribute; the attribute value of said attribute is
23 regarded as CDATA and is handled as the child element of
24 said attribute element; when said attribute is "REQUIRED",
25 said attribute element is represented by a syntactic
26 element; when said attribute is "IMPLIED", and/or when a
27 default value is defined as said attribute, said attribute
28 element is represented by an element for which said "?"

1 operator is employed, and wherein at said step of
2 converting said XML data into different XML data, an
3 attribute included in said syntactic element of said XML
4 data is represented as an attribute element that can be
5 uniquely determined, and is handled as the child element
6 of a parent element of said attribute.

7 5. An XML data encoding method according to claim 1,
8 wherein at said step of converting said ASN.1 abstract
9 syntax value into said ASN.1 transfer syntax, the PER
10 rules are employed.

11 6. A method for decoding encoded XML data comprising
12 the steps of:
13 converting a grammar definition for defining the
14 grammar of XML data into ASN.1 abstract syntax type;
15 separating encoded XML data into an ASN.1 transfer
16 syntax and the contents text of a compressed syntactic
17 element;
18 converting said ASN.1 transfer syntax into an ASN.1
19 abstract syntax value that conforms to said ASN.1 abstract
20 syntax type;
21 converting said ASN.1 abstract syntax value into the
22 structure of XML data that conforms to said grammar
23 definition;
24 decompressing said contents of said compressed
25 syntactic element; and
26 combining the decompressed contents of said syntactic
27 element and said structure of said XML data.

1 7. A method according to claim 6, wherein said grammar
2 definition includes an attribute, a process instruction
3 and a grammar definition entry other than said syntactic
4 element, further comprising the steps of:

5 converting said grammar definition into a different
6 grammar definition, so that said grammar definition entry
7 other than said syntactic element is included in said
8 syntactic element as a special element; and

9 converting said decoded XML data into different XML
10 data in conformation with said different grammar
11 definition.

12 8. A method according to claim 6, wherein said grammar
13 definition is a DTD, the element contents of which include
14 operators selected from among: ",", "|", "?", "*" and "+",
15 no operator, any combination of these operators; and
16 wherein for said ASN.1 abstract syntax type, said ","
17 operator is represented by a "sequence" type, said "|"
18 operator is represented by a "choice" type, said "?"
19 operator is represented by a combination of a "sequence"
20 type and a keyword "OPTIONAL", said "*" operator is
21 represented by a "sequence-of" type, said "+" operator is
22 represented by a "sequence-of" type having a limited size,
23 and a case wherein none of said operators is present is
24 represented by a "defined" type.

25 9. A method according to claim 8, wherein at said step
26 of converting said grammar definition into a different
27 grammar definition, an attribute included in said grammar
28 definition is represented as an attribute element that can

1 be uniquely determined, and is handled as the child
2 element of a parent element of said attribute; the
3 attribute value of said attribute is regarded as CDATA and
4 is handled as the child element of said attribute element;
5 said attribute element is represented by a syntactic
6 element when said attribute is "REQUIRED"; said attribute
7 element is represented by an element for which said "?"
8 operator is employed when said attribute is "IMPLIED"
9 and/or when a default value is defined as said attribute,
10 and wherein at said step of converting said decoded XML
11 data into different XML data, said attribute element that
12 is included as said child element in said syntactic
13 element of said decoded XML data is converted into the
14 attribute of said syntactic element and/or the attribute
15 value thereof.

16 10. A method according to claim 6, wherein at said step
17 of converting said ASN.1 transfer syntax into said ASN.1
18 abstract syntax value, the PER rules are employed.

19 11. An XML data encoding system comprising:
20 means for converting into ASN.1 abstract syntax type
21 a grammar definition for defining the grammar of XML data;
22 means for separating said XML data into the contents
23 text of a syntactic element and an element name including
24 the structure;
25 means for converting said structure into an ASN.1
26 abstract syntax value that conforms to said ASN.1 abstract
27 syntax type;
28 means for converting said ASN.1 abstract syntax value

1 into an ASN.1 transfer syntax;
2 means for compressing said contents of said syntactic
3 element; and
4 means for combining the compressed contents of said
5 syntactic element and said ASN.1 transfer syntax.

6 12. An XML data encoding system according to claim 11,
7 wherein said grammar definition includes an attribute, a
8 process instruction and a grammar definition entry other
9 than said syntactic element,

10 further comprising:

11 means for converting said grammar definition into a
12 different grammar definition, so that said grammar
13 definition entry other than said syntactic element is
14 included in said syntactic element as a special element;
15 and

16 means for converting said XML data into different XML
17 data in conformation with said different grammar
18 definition.

19 13. An XML data encoding system according to claim 11,
20 wherein said grammar definition is a DTD, the element
21 contents of which include operators selected from among:
22 ",", "|", "?", "*" and "+", no operator, any combination
23 of these operators; and wherein for said ASN.1 abstract
24 syntax type, said "," operator is represented by a
25 "sequence" type, said "|" operator is represented by a
26 "choice" type, said "?" operator is represented by a
27 combination of a "sequence" type and a keyword "OPTIONAL",
28 said "*" operator is represented by a "sequence-of" type,

1 said "+" operator is represented by a "sequence-of" type
2 having a limited size, and a case wherein none of said
3 operators is present is represented by a "defined" type.

4 14. An XML data encoding system according to claim 13,
5 wherein said means, for converting said grammar definition
6 into said different grammar definition, represents an
7 attribute included in said grammar definition as an
8 attribute element that can be uniquely determined, and
9 handles said attribute as the child element of a parent
10 element of said attribute; regards the attribute value of
11 said attribute as CDATA and handles said attribute value
12 as the child element of said attribute element; represents
13 said attribute element by a syntactic element when said
14 attribute is "REQUIRED"; and represents said attribute
15 element by an element for which said "?" operator is
16 employed when said attribute is "IMPLIED", and/or when a
17 default value is defined as said attribute, and wherein
18 said means, for converting said XML data into different
19 XML data, represents an attribute included in said
20 syntactic element of said XML data as an attribute element
21 that can be uniquely determined, and handles said
22 attribute as the child element of a parent element of said
23 attribute. It should be noted that a case is excepted
24 wherein a default value is defined as said attribute and
25 the attribute value of said attribute matches said default
26 value.

27 15. An XML data encoding system according to claim 11,
28 wherein said means, for converting said ASN.1 abstract

1 syntax value into said ASN.1 transfer syntax, employs the
2 PER rules.

3 16. A system for decoding encoded XML data comprising:
4 means for converting a grammar definition for
5 defining the grammar of XML data into ASN.1 abstract
6 syntax type;
7 means for separating encoded XML data into an ASN.1
8 transfer syntax and the contents text of a compressed
9 syntactic element;
10 means for converting said ASN.1 transfer syntax into
11 an ASN.1 abstract syntax value that conforms to said ASN.1
12 abstract syntax type;
13 means for converting said ASN.1 abstract syntax value
14 into an element name including the structure of XML data
15 that conforms to said grammar definition;
16 means for decompressing said contents of said
17 compressed syntactic element; and
18 means for combining the decompressed contents of said
19 syntactic element and said structure of said XML data.

20 17. A system according to claim 16, wherein said grammar
21 definition includes an attribute, a process instruction
22 and a grammar definition entry other than said syntactic
23 element,
24 further comprising:
25 means for converting said grammar definition into a
26 different grammar definition, so that said grammar
27 definition entry other than said syntactic element is
28 included in said syntactic element as a special element;

1 and
2 means for converting said decoded XML data into
3 different XML data in conformation with said different
4 grammar definition.

5 18. A system according to claim 16, wherein said grammar
6 definition is a DTD, the element contents of which include
7 operators selected from among: ",", "|", "?", "*" and "+",
8 no operator, any combination of these operators; and
9 wherein for said ASN.1 abstract syntax type, said ","
10 operator is represented by a "sequence" type, said "|"
11 operator is represented by a "choice" type, said "?"
12 operator is represented by a combination of a "sequence"
13 type and a keyword "OPTIONAL", said "*" operator is
14 represented by a "sequence-of" type, said "+" operator is
15 represented by a "sequence-of" type having a limited size,
16 and a case wherein none of said operators is present is
17 represented by a "defined" type.

18 19. A system according to claim 18, wherein said means,
19 for converting said grammar definition into a different
20 grammar definition, represents an attribute included in
21 said grammar definition as an attribute element that can
22 be uniquely determined, and handles said attribute as the
23 child element of a parent element of said attribute;
24 regards, as CDATA, the attribute value of said attribute
25 and handles said attribute value as the child element of
26 said attribute element; represents said attribute element
27 by a syntactic element when said attribute is "REQUIRED";
28 and represents said attribute element by an element for

1 which said "?" operator is employed when said attribute is
2 "IMPLIED" and/or when a default value is defined as said
3 attribute, and wherein said means, for converting said
4 decoded XML data into different XML data, converts said
5 attribute element, which is included as said child element
6 in said syntactic element of said decoded XML data, into
7 the attribute of said syntactic element and/or the
8 attribute value thereof.

9 20. A system according to claim 16, wherein said means,
10 for converting said ASN.1 transfer syntax into said ASN.1
11 abstract syntax value, employs the PER rules.

12 21. A method according to claim 4, further comprising
13 excepting a case wherein a default value is defined as
14 said attribute and the attribute value of said attribute
15 matches said default value.

16 22. The method according to claim 6, wherein the
17 structure is an element name including the structure.

18 23. An article of manufacture comprising a computer
19 usable medium having computer readable program code means
20 embodied therein for causing data encoding, the computer
21 readable program code means in said article of manufacture
22 comprising computer readable program code means for
23 causing a computer to effect the steps of claim 1.

24 24. An article of manufacture comprising a computer
25 usable medium having computer readable program code means

1 embodied therein for causing data decoding, the computer
2 readable program code means in said article of manufacture
3 comprising computer readable program code means for
4 causing a computer to effect the steps of claim 6.

5 25. A program storage device readable by machine,
6 tangibly embodying a program of instructions executable by
7 the machine to perform method steps for data encoding,
8 said method steps comprising the steps of claim 1.

9 26. A program storage device readable by machine,
10 tangibly embodying a program of instructions executable by
11 the machine to perform method steps for data decoding,
12 said method steps comprising the steps of claim 6.

13 27. A computer program product comprising a computer
14 usable medium having computer readable program code means
15 embodied therein for causing data encoding, the computer
16 readable program code means in said computer program
17 product comprising computer readable program code means
18 for causing a computer to effect the functions of claim
19 11.

20 28. A computer program product comprising a computer
21 usable medium having computer readable program code means
22 embodied therein for causing data encoding, the computer
23 readable program code means in said computer program
24 product comprising computer readable program code means
25 for causing a computer to effect the functions of claim
26 16.